

The Mining Journal,

RAILWAY AND COMMERCIAL GAZETTE:

FORMING A COMPLETE RECORD OF THE PROCEEDINGS OF ALL PUBLIC COMPANIES.

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Original Correspondence.

THE SCOTCH IRON TRADE—No. VI.

THE SHOTTS MINERAL FIELDS.

To a greater extent than the majority of the ironmasters of Scotland the Shotts Iron Company combine the functions of manufacturing iron with those of working the ores to be found in the extensive mineral fields of which they are the lessees. It is usual for Scotch ironmasters to lease and work mineral fields for their own purposes; but it is not usual for them to work mineral fields for the purposes of others. This, however, is done by the Shotts Iron Company to a very large extent. They are among the largest mineral owners in Scotland. Their operations are carried on in Lanarkshire, West and Mid-Lothian, and Fifeshire, and their various fields embrace not only blackband and clayband ironstone, with limestone and coal for their own furnaces, but also common, gas, and other minerals for sale. The firm also carry on, in addition to the Shotts Ironworks, which is situated on the main line of the Caledonian Railway between Edinburgh and Glasgow, and almost equidistant between the two cities, the works of Castlehill at Carlisle, where there are three furnaces in blast.

With reference to the mineral fields worked by the Shotts Company, we may be permitted to offer some facts, especially as they have lately been opening up some new fields, which give promise of great richness and fertility. Within three miles of the furnaces at Shotts Works the company have long worked blackband ironstone. They had to depend upon these pits for their main source of supply during many years. But, in the nature of things, the constant and enormous drain made upon this field could not last for ever, and long before it gave signs of exhaustion they purchased the lease of other fields in the neighbourhood of Airdrie, which they still continue to develop. Airdrie is the richest district in Scotland for the blackband ironstone, and furnishes the supply of this mineral for the Monkland, the Summerlee, and several other large and important pig-iron works. In Fifeshire the Shotts Company work two large blackband pits, and at Polkemmet, near Bathgate, the centre of the mineral oil trade of Scotland, and the locale of Young's Paraffin Works, they have a lease of a large field of the celebrated Boghead Cannel coal, used for making gas, which is now realising the unprecedented value of 65s. per ton. In connection with the issue of five per cent. preference shares, the Shotts Company had the following abstracts of the extent of their mineral resources made up last year by two of the leading mining engineers in Scotland:—

ABSTRACT OF COAL.

	Tonnage to work.	Tonnage won.
Around Shotts Ironworks.....	11,333,720	4,185,020
Morningside Lease.....	1,195,200	587,100
Castle Hill and Hyndshaw.....	1,775,000	50,000
Polkemmet.....	17,600	10,900
	14,221,520	4,813,020

Loonhead, Dryden, and Penicuik 41,978,960 2,555,520

The furnace coal already won is equal to the annual requirements of the existing furnaces at Shotts and Castlehill for nearly 15 years, and there is a large quantity of blackband, steam, and household coal for sale,—exclusive of Mid-Lothian, to which the table shows 2,607,000 tons of coal are won, chiefly at Loonhead, which is equal to 25 years' output of 100,000 tons annually. Besides the iron-making coal and common coal for sale, the table shows large quantities of ordinary gas coal, also Boghead mineral or gas coal at Polkemmet.

ABSTRACT OF IRONSTONE.

	Tonnage to work.	Tonnage won.
Total Clayband (Raw Stone).....	1,995,130	785,880
Total Blackband ditto.....	7,073,463	2,411,963
	9,073,593	3,197,843

The main source of supply belonging to the Shotts Company is in the Esk Valley, where minerals have only been worked to a limited extent up to the present time, but where it has not unreasonably concluded that there is a deposit of ironstone of immense size and importance. Among the flat strata of this valley there are at no great distance from the surface various seams of coal, which have been worked for many years by the Duke of Buccleuch and other proprietors. The edge seams comprise no fewer than 26 layers of different kinds of coal, varying in thickness from 1 ft. 6 in. to 8 ft. Towards the centre of the valley the strata dip rapidly, but they are believed for the most part to fall into the level position at no great distance from their point of outcrop. About five years ago the Shotts Company commenced to work coal mines at Loonhead, but since then they have acquired leaseholds which gave them a right to work the minerals over an area of from 5000 to 6000 acres. At Loonhead they have a tract extending about a mile on each side of the village, and with an average breadth of three quarters of a mile. In the upper parts of the valley, however, the leaseholds embrace a district six miles in length by one to three miles in breadth. Near Loonhead the company have sunk a pit to the depth of fully 100 fathoms. They are also working half-a-dozen mines close to the surface, with the most satisfactory results as regards yield and quality of the minerals. Of the 26 edge seams of coal there are 10 with an aggregate thickness of 45 ft., which can be advantageously worked for either household or manufacturing purposes. The minimum thickness is about 3 ft. There are also three seams of parrot or gas coal, one of which, on being tested, was found to yield upwards of 10,000 cubic feet of gas per ton, with an illuminating power of 28 candles. The ironstone found in this district is also of excellent quality, and the Shotts Company look forward to it as their future main source of supply. When smelted along with the richer blackband of the Airdrie district it produces the soft malleable iron for which the Shotts Company have acquired rather a celebrity. The principal seam lies about four fathoms below what is called the "glass coal;" the No. 2 seam is higher in the section, forming the roof of the perpetual coal; and No. 3 seam, which lies still higher, forms the roof of the "Charlie's coal." Hitherto the operations at Loonhead have been principally directed to the working of the lower seam of ironstone, which is also the most valuable. The ore is calcined near the pit-head, and is then carted to the Esk Valley Railway, about a mile distant, for conveyance to the blast-furnaces at Shotts. The ironstone won by the existing pits is equal to the supply of both the Shotts and the Castlehill Works for about 18 years, at their present rate of production, which is fully 750 tons per week for each of the six furnaces in blast. Besides this, however, there is a vast supply for an extended pro-

duction when the works are enlarged, and, as we shall hereafter have occasion to show, an extension of the works is not at all a remote contingency. From their gas coal field alone the company calculate on a net profit of not less than 7000Z. per annum; but this is likely to be largely increased in consideration of the enormously enhanced cost of minerals. So far as their leaseholds in the valley of the Esk are concerned, the company will soon be placed in possession of better facilities for their development, as additional railway accommodation will shortly come into operation.

In a succeeding article we shall treat of the Shotts Ironworks, tracing their progress from their origin to the present time.

IRONWORKS AND COLLIERIES IN YORKSHIRE.

THE WAKEFIELD PATENT FUEL ECONOMISER WORKS.

There are few localities in South-West Yorkshire where more charming and varied scenery is to be found than in the neighbourhood of Wakefield, although the land around it overlies some valuable seams of coal. In its vicinity, too, are some handsome mansions; amongst others may be mentioned Bretton Hall, the residence of Mr. W. B. Beaumont, M.P., the owner of the largest lead-producing mines in the world, and Walton Hall, the seat of the late Mr. Waterton, the well-known naturalist and traveller, the coal on which estate is now about to be worked by a company. Wakefield, besides being a great centre of the corn trade, has also several important works within it, one of the principal being the extensive establishment of Messrs. Green and Son, who have a world-wide reputation for their patent fuel economisers, for using up the waste heat from steam-boilers, and there are now a number of them in operation in connection with various works to the extent of upwards of 1,300,000 horse-power. They are in extensive use in the principal manufacturing districts in all parts of the kingdom, as well as on the Continent, a great many being at work at Lille, Paris, Roubaix, St. Omer, Verviers, Leyden, Haarlem, Leipzig, Reichenberg, the colonies, &c. The economisers are also in use in connection with the boilers at Messrs. Green's own works, and the advantages even to an ordinary observer are patent. It is an admitted fact to persons conversant with steam-boilers that in all cases there is a considerable amount of heat which escapes by means of the chimney that ought to be utilised. The economiser, which consists of a number of pipes, is so arranged that leakages are avoided by the exclusion of all bolts, rings, cement, or putty, the joints being all turned and bored "socket joints," the metals forced together by powerful hydraulic machinery, expressly adapted for the purpose. The firm is also the patentees of scrapers, or cleaners, in connection with the economisers for cleaning the whole length of pipes from top to bottom. They are made in movable parts that work on centres, so that they accommodate themselves most perfectly to the surface of the pipe, and are furnished with a hardened thin cutting edge, so that any formation of soot is entirely prevented, and a perfectly clean and effective heating surface is secured. The improved scrapers have also the advantage of cleaning the whole length of pipes in a uniform and steady manner.

The works are of quite an ornate character, substantial yet handsome and commanding, and are situated close to the railway (to which there is a branch line) and the Calder river, giving a double advantage for the transporting of the products of the establishment to all parts of the kingdom. The fitting-shop is large and lofty, replete with all the necessary machinery and tools. There are in the room eight planing-machines, by Maclean and Marsh, of Leeds, and other well-known makers. One of the planing machines has been in use upwards of 40 years, and is amongst the best in the place. Most, if not all, of the others are supplied with Whitworth's double tool-boxes, planing both ways at the same time. Some very fine boring-machines are in close proximity to the planers. One of them has eight cylinders, all working at one and the same time, being self-acting, and others with two cylinders. There are eight machines altogether, boring at opposite ends at the same time, each box being fitted with two tools, all self-acting feeders. A number of screw-cutting lathes are in the same part of the building, all self-acting, together with seven slide lathes.

The casting shop is a large and well-arranged building, there being all the appliances for economising hand labour, and ensuring perfection in the work turned out. By an ingenious arrangement the pipes and other requirements are machine cast, and so securing the greatest accuracy, and at the same time effecting a great saving in labour. For the conveyance of the metal to the moulds, those for pipes being fixed on an incline, there are rails overhead, by which it can be taken from one end of the building to the other. Here we were shown some ring boilers, which can be worked up to 100 lbs. to the square inch. They have some advantages over the ordinary boilers, as they can be turned round to any extent required. They are about 3 ft. diameter in the inside, and 4 ft. 6 in. in diameter on the outside.

The latter, &c., are driven by a horizontal high-pressure engine, the piston working at the rate of about 750 ft. per minute, the pressure being about 100 lbs. to the square inch. The boilers are of the usual type, and are provided with the economisers, with the improved scrapers.

In another part of the building is a powerful hydraulic-press, with 20 rams, for forcing the pipes into the top and bottom boxes, 10 at each end. By means of the machinery and appliances the pipes are fixed in the most thorough and complete manner, and such is the accuracy in casting and finishing them, and so truly are they gauged, that any accident to even one of the pipes is all but unknown. When completed the whole piece appears as if it had been cast in one solid mass. All the pipes are tested to the extent of 500 lbs. to the square inch, and are so arranged that any injury to one would in no way affect the others. The gantry on which the pipes are laid for the purpose of being forced into the boxes is a solid mass of iron, weighing about 10 tons.

The firm imports a large quantity of the best pig from several districts, and find employment for about 300 pairs of hands. At the present time there is a very great demand for the economisers, and men from the works are now fitting them up in Strasburg and other parts of the Continent, as well as at home. Messrs. Green and Son, it may be stated, have establishments in Manchester, London, Glasgow, Lille, Germany, &c.

Of the actual value of the economiser from experiments made by Capt. Beaumont, at the Paris Exhibition, with Messrs. Galloway's

boilers, the consumption of coal and water was as follows:—Without economiser—coal, 3 tons 17 cwt.; water, 5600 gallons. With economiser—coal, 3 tons 3 cwt.; water, 5600 gallons: showing a saving of 18 per cent. The water was supplied by a Gifford's Injector in the first case direct into the boilers, and in the second through the economiser, and then into the boilers. As a rule, the saving in fuel averages 20 to 25 per cent. Great, then, as are the advantages obtained in this country by the use of the fuel economiser, they are at least doubly so in those distant localities on the Continent where the coal has to be imported from a considerable distance. In saying that the works will well repay a visit, we have to state as a concluding remark that we are indebted to the courtesy of Mr. Green and his manager for the above brief notice of an establishment which contains much that is truly interesting.

AMENDMENTS ON THE MINES REGULATION BILL.

TO THE EDITOR OF THE MINING JOURNAL.

SIR,—We desire to call the attention of your readers to a most material point in the proposed amendments.

It is stated that an intention exists to move the omission of clauses 24 and 25 of the Government Bill as they now stand, in order to substitute the following:—

"For the purpose of granting certificates of competency under this Act boards of examiners shall be constituted under the superintendence of a Secretary of State in the various districts to which Inspectors shall be appointed, and every such board of examiners shall consist of nine members, one thereof a person appointed by a Secretary of State, three practical mining engineers, and three mineowners elected by the mineowners of the district as after mentioned, and two miners of the district elected as after mentioned. The first of such elections shall take place on the first Wednesday of the month of February, 1873, and subsequent elections on the first Wednesday of February in every third year thereafter; and the appointment by the Secretary of State shall be made one month thereafter respectively, and any occasional vacancy caused by death, resignation, or disqualification shall be filled up within one month after it occurs; and any person so elected or appointed shall continue in office till the following general election. A Secretary of State shall fix a convenient place within the district at which such elections shall be held, and shall have power to determine any disputed election.

Such elections shall be conducted as follows:—

I. The persons entitled to vote in the election of three practical mining engineers and three mineowners of the district as members of the board of examiners shall be the owners of mines within each district falling under this Act respectively; and the persons to be elected shall be such owners, to the extent of three, and practical mining engineers to the extent of other three. Every such mineowner shall have a vote for each working pit or mine belonging to him within the district. Where the owner is a company any one partner may act for the whole, and where the owner is a corporation the same may vote by any official empowered to that effect in writing. The persons entitled to vote in the election of two miners as members of the board of examiners shall be the miners of the district. Each miner of full age shall have a vote.

II. The Inspector of the district shall, thirty-one days before the first and each triennial election, make up a list of the owners of mines within the district, the numbers of pits or mines belonging to them respectively, and the consequent number of votes to which each is entitled; and also a list of the mines within his district, and shall forthwith cause a notice to be published in two or more newspapers within the district; that such lists will be revised and adjusted by the revisers after provided for at a place and time specified, such time not being less than ten days before the coming election.

III. The Secretary of State shall from time to time, and at least days before the first of such triennial elections, nominate as revisers two justices of the peace, or a stipendiary magistrate, having jurisdiction within the district, to revise and adjust the lists of voters aforesaid, who shall meet at time and place fixed as aforesaid, hear any objections to the list made by persons on such list, or claiming to be put thereon, or to have any other person's name removed therefrom. The revisers shall hear parties *viva voce*, and determine the matter in question; and that the list so revised shall be the list of voters entitled to elect members of the board of examiners for the next three years.

IV. The Secretary of State shall thereupon fix the place within the district at which the election of examiners shall be held, and appoint a person being a mayor, provost, or stipendiary magistrate, to preside and conduct the same, subject to such rules as may be by such Secretary of State established.

V. All necessary expenses incurred in the revision of lists, including reasonable remuneration to the revisers, as also in conducting such election, including a reasonable fee to the person presiding, shall be paid and defrayed by Her Majesty's Treasury."

Now, Sir, we most respectfully, though very emphatically, protest against the provisions embodied in such proposed substitution, so far as the formation of the certifying board is involved. While we would have it distinctly understood that we think the framework of the clause itself a decided improvement upon the two the places of which it would fill (the 24th and 25th), we are strongly impressed with the opinion we venture to place before your readers.

It will be at once perceived that neither in the Bill as it now stands nor in the proposed Amendment is there any provision for seats at the Certifying Board of Competency to be occupied by underground colliery managers, persons upon whose knowledge and care very greatly depend not only the safety of the mine itself, but to a large extent the more immediate and vital operations of the colliery. It is, therefore, thought very desirable, not to say actually incumbent, on the part of the Government to provide (alike for the safety of masters and men) such representative element; and for this purpose it will be proposed in Committee to alter the language of Clause 24 (page 16) as it now stands in blue ink in the amended Bill, so as to ensure, if possible, such representative power.

The method by which it will be sought to attain this necessary object is to insert some words and strike out others, so as to form a certifying board, thus constituted:—

Two Coal Owners,
Two Mining Engineers,
Two Underground Colliery Managers,

Two Practical Miners, and
One Person to be appointed by the Secretary of State;
In all nine persons.
The board (so formed) will, therefore, not be altered as to numbers,
but will (as we think) be more equitably and justly constituted.
May we, therefore, ask you to find room for this letter—for the
length of which we have to apologise—in the early issue of the
Mining Journal. Signed, THOMAS STEPHENSON,
BENJAMIN KEIGHTLEY.

Authorized deputation from the West Yorkshire Underground Viewers' Association, representing about one hundred important collieries.
1, Piccadilly-place, W., April 16.

MINES REGULATION BILL—CERTIFICATED MANAGER.

SIR,—I, no doubt with others of the readers of the *Mining Journal*, am much obliged to "Nitram," for his information as to the status of the Prussian "responsible manager" of mines with the unpronounceable appellation. There is nothing, however, in Mr. Bruce's Bill which leads me to suppose that the management clause will "be applied in a similar manner to that of Prussia."

Nor do I exactly understand why the idea of certain qualifications being required for an underground manager tending to produce inefficiency, should strike your correspondent as being ridiculous.

Many years ago I selected one of the coalhewers at a colliery to be a deputy overman; in a very short time he became an overman, or "underground manager," and he subsequently became an under-viewer, and afterwards the chief viewer of large collieries abroad. He was one of the best overmen I ever knew; and it is extremely probable that had Mr. Bruce's Bill, during the time of his early promotion, been law this man would have continued a hewer of coals, and that the situation he so ably filled would have been held by a less capable person.—April 15.

TIN DRESSING.

SIR,—Before introducing the above subject, some few weeks since, I was fully aware that I should incur some measure of odium in attempting to set this great branch of Cornish industry on a sound scientific basis. Looking at the interests involved—capital invested in our mines; carelessness and apathy displayed on our dressing-floors; the immense length of works, capital, and people employed to recover the wasted tin—is a subject well worthy a far abler pen than mine.

I have no differences with the mine agents and tin-dressers, or with the river workers, but with the waste entailed on the legitimate adventurer. To see the works erected, and now in course of construction, from the Tamar to the Land's End to recover the wasted tin should surely cause every Cornishman to ask, and seek to know, the reason why this? As a statesman said the other night in the House of Commons, I detest personation and personalities, and have no fear in discussing the subject with the ablest tin-dresser, if he gave his real name, but shall decline fictitious signatures; noticing, however, "Tin-Dresser," in your last issue, not for the sake of his arguments, because he gave none. "Tin-Dresser" is like the naughty boys in our street, who give the bell a long pull and run away.

I began about 35 years ago as stamps boy, and have gone on to working-man, under-agent, and manager; no doubt the managers of our tin mines are consulted about other mining properties than tin, and no one doubts their abilities and capabilities of giving sound advice. If to spend a lifetime to attain to the distinguished excellence of "Tin-Dresser" were necessary, then I come short. I was not aware till now that such high, rare, and assiduous application was necessary to reach the perfection of wasting, as is now so much in vogue. I may safely say no improvement in principle has taken place in Cornwall during the last 50 years, as I think, with all the modern appliances, more tin is wasted now in proportion to the quantity of stuff stamped than then. That many labour-saving appliances in the manipulation have been introduced I do not deny, but the principle is the same in all the buddles, &c.

"Tin-Dresser" feels ashamed of his letter before he got through, and by way of a little salve to his ebullient temper, closes by saying something about a machine at Roskear; letting out most conclusively that a change or innovation in the time-honoured custom was absolutely necessary. I ought to apologise to you, Sir, for taking up so much space, as I do not consider "Tin-Dresser" a foe man worthy of my steel pen—little dogs can only bark. The principle I started with is still intact. Mr. Green must paddle his own canoe.

In my next, with the maker's permission, I hope to give some details of a new stamps, which, from what I have seen of its capabilities, I am quite sure will stamp 15 tons per day, of 20 hours, of average Cornish stuff.

Nursery-street, Pendleton, Manchester.

MINING IN IRELAND.

SIR,—I have just seen Mr. Tonkin's letter in the Supplement to last week's Journal in reference to the Glandore Mine. The late Captain Thomas Tonkin worked this manganese mine over 30 years ago successfully, until some of the beds were exhausted, and others became so iron that it would not sell. The quantities of rich ruby, &c., copper ore, said to have been raised, never appeared in any market, and I am still doubtful if iron ore will be found in large paying quantities. I am not an enemy to "Irish mining;" nor can I possibly have an ill-feeling towards any person connected with Glandore Mine, because I do not know them, but false statements will never make a good mine.

YOUR CORRESPONDENT.

"WHAT TO SELECT—WHAT TO AVOID"—No. XVII.

SIR,—At the beginning of the year, in reviewing the prospects of the metal market, I ventured to remark "that the forthcoming supplies of tin being unequal to the growing demand, an important advance in price may be reasonably expected." Since those remarks appeared tin has considerably advanced in value. Referring to copper, I pointed out that an important advance in price was absolutely certain, basing my calculations upon a comparison of the forthcoming charters from Chili with those of previous years, and also upon the increased demand arising from the healthy expansion of trade. Chili bars were then quoted 83 $\frac{1}{2}$; the present price is 100 $\frac{1}{2}$. As to lead, I remarked at the same time that, although at a good remunerative price, the general condition of the market indicated a further advance. English lead was then 19 $\frac{1}{2}$; it is now 19 $\frac{1}{2}$ 17s. 6d.

These were the reasons which induced me, many months since, to write these columns "that no more favourable opportunity could possibly be selected for the investment of capital in sound dividend and progressive home mines." I need not now point out how strikingly these opinions have been verified by results, nor draw attention to the highly satisfactory and equally encouraging condition of mining generally.

Referring to the subject of "Circular Mining," to which I have directed attention on two or three occasions, it seems necessary to mention the fact that I do not put myself in opposition to the legitimate use of circulars; but what I do most strenuously contend is that it is the duty of everyone who has a direct or indirect interest in the promotion of bona fide mining to fearlessly come forward and co-operate in stamping out the present growing evil of fictitious circulars. I could point to many instances where five or six circulars, purporting to be published by different persons, are really so many branches of one firm. It is thus the unwary are unwittingly entrapped, and legitimate mining unjustly suffers. The strange part of the transactions that are carried on under such a pernicious system is that these ubiquitous creatures invariably exact such prices for that which they have to vend that a proportionate interest can be secured upon very much less terms in well-conducted financially sound mines, and possessing a really tangible value. I hope next week to make a few remarks relative to some of the leading Cornish mines which I purpose visiting during the next few days.

MINERAL HILL MINE.—This is another unhappy and regrettable instance of buying a mine at what may be properly termed a fancy value. Apropos of this vitally important subject—that is, to those whose interest it is to uphold legitimate mining—I have already written in this series of letters that if a mine really be in a remun-

erative condition, with large reserves of ores, a cash payment may not, under such circumstances, be incompatible with the purposes of vendees; but, even then, the amount paid should in no case exceed the net value of the ore actually laid open, which, upon an average, should never be estimated at more than about one-third its value in situ. Upon this basis, which, whatever may be said to the contrary, is the only basis for shareholders to calculate the commercial value of any foreign mine, what amount would have been paid for Mineral Hill? Pinner's Hall, Old Broad-street. FREDK. WM. MANSELL.

REMARKS ON THE ORIGIN AND FORMATION OF METALLIFEROUS VEINS.

SIR,—The formation of every complex entirety in Nature is known to be gradual, and metalliferous fissures can form no exception to the rule. Nor would the exceptions which are assumed, if true, render the process of vein formation more acceptable to our reason, or corresponding to its analogies in the other departments of nature. What is there conceivably more difficult in the gradual enlargement of a fissure by chemical action than in the decomposition of similar substances by similar agencies elsewhere, especially when it is admitted that such fissures previously existed in mechanical outline, and are known to be replete with the necessary instruments for such enlargement? There was philosophy enough in the world in Job's day to enable him to say from observation that water, by mere casual mechanical action, wore the stones, but how much more potent are its chemical powers, as proved by numerous experiments in the present day? And how much more strong, or ought to be, our convictions and assurances of the existence of such powers when ascertained, as they are demonstratively by scientific experiments, as well as from enlarged views of practical experience?

If the waters dissolve, as they unquestionably do, the metallic particles, and extract them atom by atom from the containing rocks, we can do no violence to our reason, nor offer any opposition to facts, by assuming that a similar agency is at work upon the sides of the fissures, decomposing those parts exposed to such action, and that some of the material particles thus removed may enter into combination, both mechanically and chemically, with the metals deposited from this and other sources as gangue associations, whilst that which may be unfit, or in excess of such requirements, may be ejected, and borne by the retreating currents of water—for we must admit an outlet from as well as an inlet to the fissures, otherwise the waters must become stationary, and their functions as an agent altogether cease—to enter into new combinations, and probably perform acts of restitution, by compensating for what had been extracted previously by the same or other aqueous currents in the same channel. That such a conclusion is not only possible but probable in the highest degree all the accompaniments and characteristics of the phenomenon itself unite to prove. The process requisite is no more difficult than that which is at work forming the blade of grass, the majestic oak, or even more intricate and wonderful animal organism. And as there is an analogy between these, so there unquestionably is, in my own mind, between those and the process observed in the modes of production—retrogressive changes, and reproduction in the mineral kingdom. The assertion of the principle of vegetable life from the germ of a body apparently inextricably involved in an abyss of death, and its triumph beyond such a vicissitude; its spreading its tender fibres abroad in quest of support, which is at once the evidence of an indestructible life within itself, and the dependence of that life for its development on its associate conditions and surroundings; its drawing to itself not only the means of support, but of growth and expansion; the extension of its roots through the compact and resisting soil, whether as delicate fibres or developed canals, or conduits of sustenance, to a thousands ramifications of life, is equally incomprehensible to our limited faculties, as the enlargement of metalliferous fissures would be by or from forces inherent within themselves; and if we look at the way in which the animal structure is built up and sustained the process and its results, though strikingly analogous, are still more wonderful. The arbitrary manner of conveying and receiving substance into the system, its preparation for digestion by mastication, and its mixture with the saliva of the mouth, its passing thence into the stomach, where, by coming into contact with the gastric juice, it is decomposed and converted into chyme; and this again still further effected by contact with the bile and secretions from the pancreatic gland undergoes a complete chemical change by its conversion into chyle, and so on, until eventually, by mixing with the lymph or water, it receives the proper consistence for passing into and mingling with the blood, from whence it is carried to the heart and lungs, to receive its vital and life-sustaining properties and powers; after which it is again propelled through every ramification of the venous system, capillary and otherwise, adding atom to atom, repairing the waste incident to motions, building up and completing, amongst other mineral fabrics, that beautiful and unparalleled mechanical and organic structure—the human body. Can greater improbabilities attach to the enlargement of fissures in the rocks when we know that all the requisite instrumentalities for such enlargement are at hand, than to that of a bone in the animal system which was but just previously mere cartilage; but subsequently, by ossifying, it became bone, and one of the supports of the animal fabric, and gradually enlarging from the action of an expanding force from within; by which also it assumes a tubular form, and increases from such expanding pressure both in its external and internal diameters, and forming at the same time a channel for supplying the necessary material for the internal enlargement of the bone.

The essence of all corporeal being in its growth and development appears to be motion, and motion, both in idea and fact, is inseparably associated with life, and any interruption of which tends to disease and its consequent decay. It is, therefore, to be presumed that the individual particles composing organised bodies of every kind are in a state of constant flux and mutation, unless such changes are obstructed and impeded by an arbitrary disarrangement of the parts from foreign opposing forces, superinducing disease; and their motion is not suspended, but still goes on, though in a retrograde direction, undoing what it was previously engaged in accomplishing; and thus motion symbolises life, its obstruction merely serves to divert it into other channels, and the momentary impediment surmounted serves only to accelerate its progress.

This is undeniably true of both the animal and vegetable economy, and what evidence, it may be asked, is there that it is not equally true of the mineral economy? Indeed, every physiological fact pertaining to dynamical influences, and their effects upon matter, with which we are acquainted, or have ever observed in our subterranean peregrinations, when interpreted without prejudice becomes an evidence of greater or less magnitude and force that all the individual atoms composing the earth's crust are with one degree of velocity or another in a state of perpetual motion. The fissures which constitute the receptacles of metallic and other minerals we have sufficient evidence to know were originally outlined by mechanical means, and filled, like every other interstice, pore, and cavity of the earth, with water, and that such water is incessantly in motion, and is charged with the instruments of dissolution of certain rocks, and of the renovation of others. That subjected to the wearing influences of water the hardest substances are effected in one way or another, and very frequently to the extent of their entire dissolution—the destruction or suspension of all their previous distinctive characteristics and sensible qualities.

The gradual enlargement by decomposition of the sides of fissures, though only sufficiently far apart to admit of the penetration of water, perforce of great pressure, and such water possessing the requisite qualities for reducing as a solvent all the ingredients entering into the composition of the rocks on either side of such fissures, and with which it is brought into immediate contact, is as easy as the chemical changes which are wrought in the rocks above ground by the simple action of atmospheric air and other casual influences. The fact that such waters are always charged to a greater or less extent with the several substances in solution which are known to compass the rocks through which they permeate is of itself *prima facie* evidence of what purpose it is intended to subserve in the mineral kingdom. These ingredients are not necessary elements in the composition of water, but extraneous matters, which may or may not exist therein, and which impart to it properties and qualities it would not

otherwise possess, but do not alter its radical features or constitution. From certain developed and intelligible facts in the mineral kingdom, and their analogies in the other two departments of nature, it is to be presumed that lodes and cross-courses of every kind, according to some systematic arrangement in nature, are in their several groups simultaneously formed, and each individual lode and cross-course is but a part of a system of which each part is interdependent on the others, and variable in magnitude and extent by local influences, however remote in point of time they may have operated, and that the lodes are necessary to the formation of the cross-courses, as the cross-courses are to the formation and productiveness of the lodes, neither of which could take place if unassisted by the other. It is, therefore, evident that the alleged difference of age between lodes and cross-courses of the same group, said to be determinable by their intersection—that the one which is continued through the other, whether otherwise displacing it or not, is reported to be of posterior origin is totally presumptive, and unsupported by any facts or facts I have ever seen or heard of in connection with such phenomena, and is apparently, if not evidently, to me the most unscientific conclusion ever arrived at, credited to science as one of its discoveries, and so extensively accepted and endorsed by celebrated explorers in the arcana of geology.

It is something to assail what is regarded as an established fact in geological science, and it is not without due deliberation that I do so; but I am convinced that truth has its claims on every one of us, and until more substantial reasons are assigned for such occurrences than I have hitherto met with, or can form conceptions of in my own mind, I shall feel myself justified in adhering to the views derived from observation and experience, when conformable to reason, and harmonising with nature in all her departments.

If I should ask by what power or force the blade of grass, shrub, or tree extracts the nourishment from the parent earth which they derive from that source I should probably be told that it was by capillary attraction; but if I further interrogate by asking what is capillary attraction in its relation to the growth and expansion of vegetable life, I should probably be regaled with something most truly Aristotelian so far as its philosophy was concerned, which would merely explain the mode and the effect of the operation, and leave altogether unanswered the mystery of the phenomenon itself—the specific cause. But if I were similarly interrogated respecting the gradual widening of fissures in the rocks by the chemical action of water, I might be able to affirm, and without fear of successful contradiction, that the invidious waters possessed a power of penetration which enabled them to insert themselves interstitially between the molecules of matter, and thus by interposing a sensible barrier to the action of molecular attraction their affinity for each other was overcome, and decomposition immediately followed. I have already premised that part of the materials won from the sides of the fissures in this way may enter into combination with the metals and form the ores; and part by combining with other elementary substances may form the gangue, or matrix, of such ores, and occupy the same fissures; whilst the third and remaining part may be ejected from the fissures through the medium of the retreating waters, and be by it borne to destinations contiguous or remote to subserve the ever-active and all-comprehensive purposes of nature in the vast and endless process of mutation to which all material bodies are subject.

Ellsworth, Nye County, Nevada.

ROBERT KNAPP.

THE EBERHARDT, SOUTH AURORA, AND UTAH SILVER MINING COMPANIES.

SIR,—Under the above heading I noticed a letter in the Supplement to the Journal of Feb. 17, and signed "A Believer in White Pine Pockets."

Having had the management of silver mines in Chili, in stratified limestone formations, for about eight years, subsequently also for two years in Mexico and Spain, producing precisely the same class of ores as those of White Pine—namely, chlorides of silver, called by practical miners horn silver—I believe a few observations and data on the above formations may be found useful in furthering the interests of mines in like formations in the United States, for until recently, comparatively speaking, they were not known here.

The experience in silver mines in stratified limestone formations in Chili dates back as far as 1808, at which period the silver mines of Agua Amarga, province of Huasco, were discovered. The celebrated mines of El Doctor, in Mexico, likewise in similar formations, were worked for about 30 years, and produced some \$40,000,000 worth.

In 1836 an Indian, of the name of Juan Godoy, chasing some guanacos in the sierras of Copiapo, in Chili, discovered silver mines. Accidentally losing his way, he was forced to camp out for the night, and to collect wood for a fire, which he had to keep up during a great part of the night in consequence of the cold blasts from the Andes. He chose, as is usual, a spot where he could protect himself—namely, a reef that stood out boldly from the ground, or what was called by the miners large croppings. Great was his surprise in the morning on rising at finding large pieces of native silver around the spot where the fire had come in contact with the croppings. It was soon proved by those who set out to inspect the wonderful riches found by the Indian that great masses of horn silver had been discovered accidentally in stratified limestone formations, and that the native silver was due simply to the fire which had come in contact with the ore.

These mines were vigorously worked from 1836 to 1848, and kept some 12 mills constantly supplied. The crushing was carried on by so called Chilean mills and the patio amalgamation. In 1838 Mr. Stevenson, an English gentleman, was the first to make an improvement for working these free milling ores, and invented the tinas, or pan, system of amalgamation, which was exported from Chili to California in after years. Everywhere I have noticed that these formations produce free milling ores at surface, to a depth varying from 50 to 250 feet.

In one district alone in Chili, called Chanarcillo, it was ascertained by the dues paid to the Government that the amount of silver produced from these formations in about 12 years reached the sum of \$20,000,000, and this from the free milling ores taken from surface to the depth of 250 feet.

About the year 1849 these ores gave out completely at the above depth, and in a most sudden way, most discouraging to every mine owner, so much so that the Government granted them leave to "disfrutar," or take out all the arches, or pillars, that the mining laws enforce to prevent the mines from caving in; and this is only to be granted after the Government mine surveyors have officially notified that the mines have ceased to be productive.

Mr. John Sewell, an English gentleman, who had owned one of the above mines for some years, and having made a large fortune was loth to abandon it, and determined to solve the mystery. He noticed not only the sudden disappearance of all trace of ore, but a sudden contraction of the vein from 6 ft. to about 1 in., and in many places a thin cleavage of not more than $\frac{1}{4}$ in. For two or three years he continued his explorations; levels, winzes, &c., were driven, but with the same results; not a trace of silver in the pinched part of the lode. Later on the same applied to all the mines in the district. Sinking was continued till they went through about 280 ft. nearly perpendicular, say 83°, which was the underlie of the lode. At this period of the work he was absent in Europe, fortunately, which induced the manager of the mine to continue sinking for two months longer, awaiting his arrival to abandon the mine altogether. Within the above short period this narrow cleavage, or lode, changed as suddenly again as it had disappeared before, to a width of 6 ft. This event took place in 1851, when the writer of this took the management of the mine, and continued therein till 1857. The ores in this new strike changed completely, their composition being mostly ruby silver ores, without any trace of free milling ores. We have in Chili exactly the same change in the copper mines, from free smelting copper ores (carbonates and silicates, ores that can be smelted into bar copper in one operation) into sulphurets, under similar conditions of depth.

At the depth of about 600 ft., where the sudden expansion of the lode took place, the writer extracted 9 $\frac{1}{2}$ tons of native silver, which produced 90 per cent. of their weight in pure metal on being melted down in the bar furnace. This kidney of native silver was surrounded by masses of pure ruby silver: 400 tons of this ore was

Seeing that every advantage is found for mining in this county, always water in abundance, good roads, easy dues, comfortable lords, willing miners, and experienced engineers, I do often wonder why speculators should go so far from home to spend their money, well knowing that in most instances they are better off back again; neither do they care to improve the property at all, but by some means or other to get it sold; but here one may enter as shareholder in any mines in the Principality, come and see where their money is to be expended; and if one likes the property, well and good—if not, he can but return home, if not a wiser, a better man, for having spent a day or two amongst the Welsh hills, and all to be done for \$1. How many miners are there who are shareholders, would not be enlarged and pushed on with greater speed, so as to try them as fast as properly mining speed will allow; and if favourably progressing on wish them; if not, stop them? I ask how many are there that would be entitled to the latter? Scarcely one. Then, mining proprietors push forward, least for the time, plenty of virgin now the summer and long days are coming, and the more we have, the more we need. It is useless fighting on paper with pen and ink, as has been seen the last fortnight; it will do no good. Neither is it right that such glaring reports of properties (so often abandoned by the greatest mining men of the day) should find place in our newspapers, and thus cause much loss of money to many genuine and parties into any uncertain undertakings, whilst others are made to lose money really getting things to be put into for a void. The country is full of many genuine and real mines in the north-western district are most of them improving, and ere long many more than have as yet appeared in the progressive list and dividend columns, may stand forth and become the richest in that county. A fortnight ago I was there; all well; shall be going again this week, and shall be glad to

shaft, Cachoeira, is still improving in size and quality, worth now 60 cts. of gold per ton, 2 ft. 6 in. wide. This will prove of some value to us during the month.

JAVALI.— Captain Sohns, March 6: 1250 tons of quartz had been crushed. Remittance of gold by this mill, 511½ ozs., valued at \$350.7; expenditure, \$185.17; 101.1; profit, 154.2. A steam-engine and boiler leaves for the mine by the West India mail sailing on the 17th inst. The new stamps have already been sent.

TACUARI.— Captain W. H. Martin reports for February that the operations on the whole have progressed fairly, but, owing to an unusual quantity of rain this month, some of the exploratory points have been suspended until the weather becomes a little more settled. Repairs in shafts, levels, and water courses have been made in several places where timber was found decayed, and wood of better quality substituted. The work treated at the stamps shows a little improvement upon last month. The produce amounts to 476 ozs., derived from 39 tons of stuff, equal to 12.2 ozs. per ton. For the first division of March it is reported that the sanitary state of the establishment is more favourable than last month. The work excavated for treatment is being derived chiefly from No. 2 lode in the back of the 25 ft. level, west of Haymes's, near the junction, and from the appearance of the sand at stamps is of low standard.

CHAMPION (Gold and Silver).—The directors have advised for their agent at the mines that the net produce for the fortnight since the preceding report was \$97.1. This makes total net produce for the eight weeks 3067.1, being for the respective fortnights 637.7, 710.8, and 898.6.

SNOWDRIFT (Silver Mining and Reduction).—The directors have received the following intelligence from Mr. Foster, their engineer: "Second shipment of silver ore, amounting to 39,600 lbs., has left for Liverpool, and assays 260 ozs. per ton of 200 lbs."

CLIFTON (Silver).— March 23: In the Clifton Tunnel east the vein is improving. To-day in my presence some fine-looking galena was broken, and altogether bears an encouraging appearance. The ore is improving in the Clifton top level, and I think is likely to be better in quality than any we have had from it before. The east driving from the Clifton shaft foot is as productive as ever; we intend making a surface opening by this driving for ventilation, and the reduction of future expenses.

COLORADO TERRIBLE LODGE.—The following are extracts from the agent's monthly report of February:—First Level.—Slope No. 4: Very good vein of mineral, 4 in. wide, of excellent quality. Third Level.—Slope No. 5: Varied in width of vein from 2 to 4 in.; this is also of good assay. Second Level.—Slope No. 4: In this slope we have a fine vein of ore, 6 in. wide, solid. Third Level.—Slope No. 6: Good good all through, 4 in. wide, of solid mineral. Fourth Level.—Slope No. 2: Good vein of ore all the length of the slope, 60 by 45 ft. high; this will take until about April to work out—4 in. of rich mineral all through. Fourth Level.—Slope No. 2 East: This continues the highest grade ore in the mine, averaging from 2 to 3 in. of vein. Fourth Level: Drift East: Westreck the shaft on Feb. 10; after the water had run clear we made a thorough examination. I find we are direct on the lode with our drift. The lode measures from south to north wall of shaft about 16 ft., which is full of small veins of mineral from ½ in. to 1½ in. wide. Produce of ore of all grades during the month, 145 tons.

SWEETLAND CREEK.—C. D. McLean, March 22: We have cut the inner and main seam in the new tunnel; the seam is excellent. We will now follow this seam entirely in to where we shall raise the shaft through which to wash through the new tunnel. We can now safely say that the danger of hard and expensive rock is past. We are still working on the creek, new tunnel in 50 ft., steam excellent, rock soft, and progress will be more rapid than heretofore. We are considered here as remarkably fortunate with our tunnel, our progress being double that of any other tunnel ever driven in this vicinity. I am satisfied I can drive it in 12 months more from the one face, and it is a matter of question whether or not it is better to sink.

BIRDSEYE CREEK.—J. A. Stone, March 9: Nearly all the run was made from ground on which the town of Yonkston before the fire which destroyed it, in 1867. I encountered large quantities of lead, which amalgamated with the quicksilver and gold, and it is impossible to separate them, except to cut the lead up with a pick, which takes considerable time; therefore, I cannot yet tell the gross returns of the run. During the run I lost over three flasks of quicksilver, which can be attributed to no other cause than the lead; and as a natural consequence where so much quicksilver escaped from the flames it took considerable gold away with it. If the quicksilver continues to lose in proportion to the loss run I shall be compelled to employ Chinamen, and skim off the top of the ground and lead. The adit is rich hydraulic dirt, and, I think, would pay much more than the expense of stripping about what it has already paid without stripping.

PACIFIC.—Capt. H. Priddle, March 29: The mine is looking much the same as when I last wrote you. The stamps and levels are yielding rich ore. We are about to let another contract to drive east on the Bual North Star ledge; the vein here is very promising, and I am of opinion that it will soon be rich. There is nothing else at present calling for any particular remark.

I. X. L. (Gold and Silver).—Bullions, March 25: In consequence of some misunderstanding between the contractors who are running the tunnel, two men left their work in the beginning of the week, and were not replaced by others till the 21st. There has, therefore, not been full time put in during the week. I hope, however, now they have the proper complement of men that the work will go on without further interruption. Mine looking well.

GOLD RUN.—A telegram has been received from the company's agent as follows: 24 days' run. We have cleaned up \$5400 gross; \$3500 net. The directors have declared a second monthly dividend at the rate of 20 per cent. per annum, free of income tax, and have carried forward the balance being over 8 per cent. to the reserve fund.

ECLIPSE (Gold).—The following information has been received from the mines, under the signature of the late Mr. Henry Triggles:—Duplicate of report, dated March 18, original not to hand: General Operations: The operations at and around the mill have been rather unsatisfactory, not being able to half supply it with quartz. We have just cleaned up after crushing, not over 200 tons, which yielded \$1000, without touching any tailings. In the time we were partially running we ought to have stamped 800 tons of quartz, but all I could do I could not get more rock hauled. The mill and other machinery gives good satisfaction. Tramsroads: We have graded about three-quarters of the incline, and have laid 1100 ft. of road, and a small part of the incline, and by the 25th inst. it will be finished positively, and the iron put on the wheels at once. We shall then commence to lay the track down the incline. This is no small job, and will take at least three weeks to finish; we shall then bid good bye to the tramway; rest assured that this is being pushed on as fast as it is possible. Hoisting Works: The steam-engine to hoist quartz out of the mine is erected, and ready to be attached to the hoisting gear, which will be soon completed. Mine: We are working three stops for gold ore, and one for silver ore, without any change to note. In the stops in the 30 ft. level we can get gold and silver ore, free of income tax, and have carried forward the balance being over 8 per cent. to the reserve fund. As we find that in depth we get less base metal in our quartz. Most of the ore crushed last was from the 100 and 100 ft. stops. Sinking Works: As per last report, we are sinking slowly, but satisfactorily—slowly, because we are putting through but about 125 tons per month; this amount we have slugged, and to-day we stop the slugging furnace for repairs, and start in a few days with the blast-furnace. In erecting this sinking works I strictly avoided trying any experiments or in furnaces, but built it as are those of Cerro Gordo, where they have for years been sinking successfully; but at that place they have all the fluxes and galena, and can sink it a great deal faster than we can. The silver ore we have partially smelted is estimated to be worth about \$200 per ton. Conclusion: I am glad to tell you that at last we have got some lumber to finish our concentration, without which we can get on but badly, and with the same, in conjunction with the treatment by "chlorine," as referred to in my last, the Eclipse Mine will surely pay.

March 26.—Since writing you on the 18th inst. our operations have been somewhat more satisfactory. The mill has run four days, and stamped 72 car loads, which I think will weigh close on 80 tons, of which the car load is estimated by Captain Francis at 1 ton. The appearance of the copper plates in and outside of the battery show a decided improvement in the yield of gold and silver, which cannot be decidedly ascertained till we clean up, and that will be done and fully reported on, as well as all other matters, for the general meeting. The tramroad around the mountain will be laid to-night, when an incline will be at once commenced on. No change to notice at the mine, except at the 300 fathom level stops, which is an improvement. I regret that we are not able to continue sinking the 100 fathom level, but at that place they have all the fluxes and galena, and can sink it a great deal faster than we can. The silver ore we have partially smelted is estimated to be worth about \$200 per ton. Conclusion: I am glad to tell you that at last we have got some lumber to finish our concentration, without which we can get on but badly, and with the same, in conjunction with the treatment by "chlorine," as referred to in my last, the Eclipse Mine will surely pay.

BENSBERG (Lead Mining and Smelting).—J. H. Hoffman, April 13: We removed the portable engine and centrifugal pump from their former position on the old shaft, and placed them at the south-west end of the open-cut. The hand-pump is thus no longer necessary to keep down the water, and will be used in sinking the new shaft. We have sunk a well for the centrifugal pump 6 ft. deep in the open-cut, and found the wash ore unaltered at the bottom. I have had to wait for timber for the new shaft, but re-commenced sinking to-day. We have opened more ground on the old road, and found carbonate of lead ore from 4 to 6 ft. under the surface sand in veins about 1 ft. thickness. Last month's produce will be sampled and re-weighed at Stolberg to-morrow.

ANGLO-ARGENTINE.—Capt. J. Vivian, Feb. 18: We commenced amalgamating with two arrastres on 6th instant; the first amalgam was taken out a few days since, and looked fair. We are now awaiting arrival of retorts, which are coming up with next troop, together with last instalment of amalgamating machinery, engine, &c. The mining operations continue to progress favourably; lode at section Chairman opening out well.

PESTARENA UNITED (Gold).—T. Roberts, J. Roberts, J. Roberts. The gold return for March was 297 ozs. 6 dwts. 20 grs. from 60 tons of ore.—Val Topa: The end driving south on side lode in Zero level yields 4 tons per fathom, at 12 dwts. per ton. The stops in back of No. 1 level yields 9 tons per fathom, at 10 dwts. per ton. The stops in bottom of this level 8 tons of ore, at 12 dwts. per ton. The end driving on western part of quartz lode, 9 tons per fathom, at 12 dwts. per ton. The stops in bottom 10 tons, at 15 dwts. An intermediate drive south above No. 2 level, 9 tons per fathom, at 8 dwts. No. 1 stop, back of this level, 12 tons per fathom, at 12 dwts. per ton. No. 2 stop, at 8 dwts. The winze on the flat lode, 9 tons, at 7 dwts. The stop in bottom of this level, on the new lode north and south of winze, 11 tons, at 10 dwts. The end driving north fourth cross cut, on eastern part of the Great Quartz lode, 15 tons per fathom, at 9 dwts. The stop on quartz lode, under No. 2 level 15 tons, at 10 dwts. The stop in bottom of intermediate level south 6 tons of 10 dwts. The end south on quartz lode, 9 tons of 7 dwts. The winze in bottom of this level has been com-

municated to the rise in back of No. 4 level, laying open a good piece of stopping ground. In the first cross-cut, west in No. 3 level, we have reached another branch carrying pyrites. No change in the cross-cut west in the level above No. 1.—Postarena Mines: Acquarite: The winze shaft is now down to the 46, and we are now engaged in the skip-road in the shaft from the 53 to the 46 level. The 33 ft. level end driving south yields 4 tons per fathom of 10 dwts. per ton. The 35 ft. level end driving north, 3 tons at 10 dwts. per ton. The end driving north on No. 2 lode in the 33 is yielding some ore. The end north on No. 5 lode in this level, 2 tons of 15 dwts. per ton.—Surface: In the Marmaza Valley we have in the past month worked on an average 28 small mills per day. The weather has been fine.

PONTGIBAUD.—W. H. Rickard, April 2: Roure: The 80, south of Agnes's shaft, yields ½ ton of ore per fathom. The 60 north, on Virginia's lode, yields stones of ore irregularly; the same level south yields 1 ton of ore per fathom. The 40 north yields 1½ ton of ore per fathom, and the same level south ½ ton. The 20 north is improved in appearance, yielding stones of ore at the foot; the same level, on the eastern part of the lode, is poor. The rise in the back yield ¾ ton of ore per fathom. The 20 south is in a regular well-defined lode, but yields no ore to value. The add north yields 2 tons of ore per fathom. The same level south yields a little saving work. The stolen cross-cut, west of Paul's shaft, is wet, and spare for driving. The rise in the back of the same level, north of Paul's shaft, yields ½ ton of ore per fathom. The mill add level south yields from ½ to ¾ ton per fathom; the same level north is poor, and has been suspended, being in shallow ground. Our stops and pitches maintain their usual yield.—La Grange: The 100 north, on the western part of the lode, yields a little ore, worth ½ ton per fathom. Our tribute pitches are improved in value during the past month.—Miche: The 100 in the bottom of the 20 yields a quantity of ore, but yields no ore to value. We have at the add north to drive on the No. 2 lode, which at this point is unproductive.—La Brousse: Basse's shaft, sinking below the 120, continues in pretty hard rock. The 120 south is in a large lode, yielding ¾ ton of ore per fathom. The 100, in the same direction, yields 1½ ton of ore per fathom; the winze sinking below this level yields 1 ton of ore per fathom. We have holed the rise from the 100 to the 80, opening out a pretty good piece of ground. The 80 south continues in a very large hard lode, 12 feet wide, of ore stuff; the rise behind this end is unproductive. The 60 south yields ½ ton of ore per fathom. The lode when being undercut behind this end continues to yield 3 tons of ore per fathom. We have two stops and twelve tribute pitches altogether, yielding very fairly.—Pranal: The 70 north is unproductive. The same level south, on the eastern part of the lode, gives ½ ton per fathom. The 70 south still yields from 1½ to 2 tons per fathom. The 50 north is unproductive. The 50 cross-cut west has intersected the eastern part of the lode, which has a promising appearance, and produces stones of ore. The 30 south is poor. The 80 north, on No. 2 lode, yields no ore of value; the same level south yields a little saving work. The stops and tribute pitches throughout this mine have, on the whole, somewhat fallen off in value during the month. Surface: Our outdoor works and dressing have gone on without any serious interruption. Our samplings have amounted to 281 tons.—St. Amant: The 25, north of Susan's shaft, has been holed (with borer-hole) to the old shaft without accident, and has let down the water, causing at the same time a crush in the adit, which we are repairing, in order to examine the extent of the old workings. The 25 south continues in favourable ground; the lode is rather disordered, and poor.—Labrugue: At Laplanche the lode has resumed a more regular appearance, and yields stones of ore stuff. At the Monlie de Luster the lode is small; it continues to yield stones of ore in bays.

[For remainder of Foreign Mines see to-day's Journal.]

AUSTRALIAN MINES.

YUDANAMUTANA (Copper).—Mr. Martin writes, under date of Feb. 22, from Adelaide as follows: I leave for the mine to-morrow in company with J. J. F. Boring, the gentleman in charge of the mine. Mr. Boring is the intended manager of the colony. I have also appointed Mr. V. Laurence, the late local secretary to the company, to act as a committee of advice with Mr. Boring in all matters connected with the company's affairs in the colony. Capt. Terrell reports, under date of Feb. 25: I am very pleased to be able to report a considerable improvement generally in the mine, and am sure that for the future our returns will be greatly increased, and the company in a very different position in a few months.—Hill's Lode: I put the men to sink on the back at the 45, and am pleased to say that the lode is turning out well. This place will turn out a large quantity of ore when we get to work upon it. The stops at the 11 and 25 have been turning out some good carbonates during the month, and are still looking well. The furnaces are working very well, and turning out a good amount of copper, which I have no doubt will shortly be very much increased. Wood has been coming in in fair quantities since the last heavy flood. Ore smelted, 395 tons; copper made, 41 tons 17 dwts. 2 grs.

PORT PHILLIP AND COLONIAL (Gold).—The following telegram has been received, dated Galle, April 16, in anticipation of the mail leaving Melbourne on March 29, and due here on May 13:—"Mouth ending March 26: yield per ton, 4 dwts. 21 grains."

ENGLISH AND AUSTRALIAN (Copper).—Port Adelaide, March 1: The quantity of coal at Port Adelaide was 228 tons. There were seven furnaces at work at Port Adelaide and one refinery. The 62 tons of copper advised by last mail as in course of shipment had been increased to about 69 tons, and shipped, and there were 100 tons of copper ready for shipment.

ANGLO-AUSTRALIAN (Gold).—Mr. Kitto, Fryerstown, Feb. 29 writes:—"The contractors are getting on well with the stamping batteries. Vivian and Sons have delivered nearly the whole of the castings, and the contractor for the erection (Summerland) has already nearly finished the building, in addition to having the foundation for the 'horses' bedded in concrete. I think it will be completed nearly about the contract time." Capt. Ralsbeck, Feb. 28, reports:—"I have the honour to report progress on the mine since the 1st inst. No. 2 engine-shaft west has been sunk 12 feet since last report, sinking through hard compact sandstone—no present change. Depth of shaft from pit 101 ft. at 70 feet from shaft commenced a winze on back of the lode, sank to a depth of 15 feet, and passed through several blocks of stone, but found nothing to warrant a further trial to the west at present. South shaft, same line, commenced a cross-cut at 110 feet to the west to intersect the lode struck in sinking the shaft at 45 feet. Country very favourable for golden stone. I expect to cut through the lode in a few feet. Present length of cross-cut, 45 ft. At No. 1 engine-shaft east I commenced a cross-cut at 92 feet east, to enable the men to work the rich spurs so profitably worked at a shallower depth some ten years back. Obligated to abandon the drive for the present, owing to the quantity of will, having to hold through in a day or two. Mr. Lamb also writes:—"By the mine captain's report you will see the progress made in sinking and driving; I had expected before this that sinking would have been resumed in No. 1 engine-shaft, and regret that it is not so, as I believe that for permanent good results in this locality (Castlemaine district) depth is required; however, before next mail I trust sinking may be resumed. The contractor has delivered most of the ironwork for the 15-head battery, and it appears quite satisfactory. The contract for the erection of the stamp house and machinery has got the home covered in, most of the bed logs laid, and has commenced with the iron work; when finished we shall have a first rate little battery, easily added to if required."

SCOTTISH AUSTRALIAN.—The directors have advices from Sydney, dated Sydney, Feb. 28, with reports from the Lambion Colliery to the 2nd. The sales of coal from Lambion Colliery during the usual slack month of January amounted to 8779 tons.

YORKE PENINSULA.—The directors have advices from the committee at Adelaide, dated March 1 last, with reports from the Kurilla Mine to Feb. 28. The committee were continuing to carry on operations on a limited scale, in anticipation of receiving advice of the steps being taken in London for raising more capital. This advice would reach them by the mail reaching Adelaide in the middle of March last, and the committee would then be in a position to carry out the contemplated work for sinking on the 17½ fms. of ore ground lying in the bottom of the 25, west of Doeble's shaft: 10 tons of ore, averaging 1 per cent. for copper, had been sold. Capt. Anthony, in expressing an opinion as to the value of the mine if vigorously worked, writes:—"Allowing for the uncertainty attending mining enterprise in every country, I do not hesitate to say that the future of this property is settled if a fair monthly sum were expended on it, a considerable portion of which, after the first eight months, would be met by sales of ore."

AUSTRALIAN UNITED (Gold).—Mr. Kitto, Feb. 29:—"Great and continued mishaps have occurred at the Central, but the manager informs me that he expects to be obtaining auriferous wash-dirt in a few days."

MINERAL WEALTH OF VIRGINIA.—The termination of the war and with it the overthrow of that institution which has ever acted as the only and substantial barrier against the development of the South—either by spontaneous action or by direct force abroad—are rapidly concentrating the eyes of the whole nation upon the surprising natural wealth which Virginia contains, and are likely to reveal a grandeur and amount of resources of which the world had hitherto but a very remote conception. Any one, on taking a glance at a map of the United States, will notice that extraordinary chain of mountainous ridges, like a magnificent anomaly, from the vast level expanse of a whole continent. This mountain chain—the Alleghenies and the Blue Ridge—indicates the course of one of the most extraordinary belts of richness to be found in the world. This great zone can be distinctly traced, in one unbroken line, over a length of more than 500 miles, extending all the way from Maryland to the south-western extremity of North Carolina, and running parallel with the Alleghenies. Its width is, in its broadest part, from 20 to 25 miles, and at times it is contracted to a distance of only 2 or 3 miles. The value of this region, however, comparatively unheeded and neglected by the world at large, was by no means unknown to scientific men, both native and foreign. Throughout the whole of the California excitement there were plenty of learned and practical people who were well aware of the fact that, within two or three days' easy travel from New York, the mining gold of Virginia was concealed in the very same wealth which hundreds of thousands are willing to go and delve thousands of perilsous miles away in the wilds of California, Idaho, Nevada, and Colorado. But of what practical avail was all their knowledge, so long as slavery—that selfish and obdurate sentinel—stood barring the door of progress, not only against foreign but even local enterprise? But for the overthrow of this institution Virginia and all her treasures would have been to-day and for ages to come a sealed book to the rest of the world. Prof. Frederick Overman, one of the most skillful mineralogists of the age, says, as far back as 1851, in his work entitled "Practical Mineralogy":—"There are gold-bearing localities in Virginia and North Carolina which, if not equal to those of California at present, will be of greater importance in the future, and I predict, more sure and lasting." In another place, while favourably comparing the mineral formation of Virginia with that of other more renowned localities, he says:—"It may be asserted as a fact that all native sulphurets, particularly all the sulphurets of iron, contain gold. As sulphurets cannot possibly penetrate any rock but from below, we may naturally conclude that the heaviest body of such kind of ore must necessarily lie deep in the earth. This conclusion is supported and confirmed by practice; for all pyritic veins are invariably found to improve in quantity and quality with the depth. This circumstance speaks very favourably for the gold formation of the Southern States. We have here a belt of gold ores of unparalleled extent, immense width, and undoubtedly reaching to the primitive rock, which on an average cannot be less than 200 feet deep. Here is a mass of precious metal, enclosed in the rocks, which cannot be exhausted."

ages; and, in this respect, the region in question—Virginia and North Carolina—is the most important of all known gold deposits, California not excepted. Harper's New Monthly Magazine.

PEAK DOWNS COPPER MINING COMPANY.

The eighteenth half-yearly meeting of shareholders was held at Sydney, on Jan. 31.—Mr. BENJAMIN BUCHANAN in the chair.—The directors submitted to the shareholders the result of the company's operations for the half-year: 6955 tons of ore, of the average of 20 per cent., had been smelted, producing 1370 tons of refined copper, which had been removed from the mine nearly as fast as made.

The plant, machinery, and furnaces are in efficient working order. The mine has lately been again visited by Mr. J. S. Mitchell, one of the directors of the company, who continues to report most favourably on the quantity and quality of the ore, on the abundance of fuel in the neighbourhood, and on the value of the company's property. The steam-engine, pumping and winding gear required for the new shafts have been constructed, and are on the way to the mine. Sinking will begin forthwith, and will be proceeded as fast as the number of miners available for that purpose will permit, without interfering with the weekly production of copper: 31 miners have lately been added at the mine, and a larger number is shortly expected. Although the last dividend, of Dec. 23, received from the company's agent in England, states the sales of cakes had been made at 86½, and that a further rise of 2½ had taken place, account sales at the rate of 8½ only have come to hand. The directors have adopted this figure in estimating the value of copper in suspense account, home market, and the fact that so large a sum of the produce has yet to be realized, to keep to what they deem a perfectly safe quotation. The balance sheet shows that all the company's liabilities have been paid, and that there was a credit of profit and loss account, on Dec. 31, 63,823.4s.3d., which the directors propose to appropriate as under:—

In writing off the book value of the mine £10,000 10s. 0d.
1.—To the preferential shareholders' interest for the half-year, at the rate of 8 per cent. per annum on £5,334.10s.0d. £1833 7s. 2d.
2.—To the non-preferential shareholders' interest for the half-year, at the same rate, on £5,666.10s.0d. 2068 12s. 10d.
3.—To all shareholders equally a bonus in increase of dividend of 36 per cent. for the half-year 28,061 0s. 0d.
Being equal altogether to a dividend of 80 per cent. per annum, and leaving at credit of profit and loss account, a balance of £12,823 13s. 10d.

PROFIT AND LOSS ACCOUNT.
July 1, 1871.—To dividend paid £15,000 0s. 0d.
Amount written off the book value of the mine 14,587 0s. 0d.
Dec. 31, 1871.—Cost of raising, dressing, and smelting, and refining copper, purchase of fuel, repairs, inland carriage, freight, insurance, management, direction, interest, exchange, &c. 34,391 9s. 8d.
Decreased value of copper in suspense account 14,000 0s. 0d.
Balance £12,823 13s. 10d.

Total £102,600 12s. 0d.
June 30, 1871.—By balance £102,600 12s. 0d.
Dec. 31, 1871.—Amount received during the half-year on account of copper—Advances on shipments and proceeds of sales 112,390 0s. 0d.
Total £214,990 12s. 0d.

Copper in Suspense Account.
Dec. 31, 1871.—Estimated value of copper made and of ore raised now on hand, as under:—
Net proceeds to receive from shipments not yet accounted for: 293 tons refined copper, shipped to England under advance of 70½ per ton, valued in London at 80½, will leave at credit of the company, after payment of charges, 54 per ton. £15,984 0s. 0d.
291 tons at the mine and on the road, at 60½ lbs. 29,682 12s. 0d.
Ore at grass—
5000 tons of 20 per cent. ore, equal to 1000 tons copper (less 20 per cent. for contingencies, 200 tons), leaves 800 tons of copper, at 38½ 9s. 3d. 20,768 12s. 0d.
Total £66,434 12s. 0d.

[For remainder of Meetings see to-day's Journal.]

MINING IN ANGLESEY.

We gave an account a few weeks since, in the *Mining Journal*, of the opening of the Panty-Gaseg Copper Mine, by Mr. Henry Gibson. We have now the translation of what took place at the miners' dinner, which will be highly interesting to those who employ a body of men under them.

Whilst the festivities were going on at the Dinorben Arms Hotel another very interesting feature in the day's proceedings was taking place at another inn. An excellent and substantial dinner was given, with his usual liberality, to the miners and the men employed at the mine by Mr. Henry Gibson, at the Belle Head Inn, and presided over by Mr. B. Evans, the agent of Mr. Pittelard, of Trefawen, the lord of the soil. The dinner was all that could be desired, and of the best quality, and reflected great credit on the culinary qualifications of Mrs. Jones, the landlady. Ample justice was done to the dinner by all parties present at it. The repast being over, a very interesting and happy evening followed, and later in the evening Mr. Gibson, attended by Mr. J. M. Williams, the managing agent of the mine, paid them a visit, and remained with them about a couple of hours. Mr. Gibson, in addressing the men, made some very trite and happy remarks with regard to their future conduct, happiness, and prosperity. He said that he always felt happy in seeing and helping young men to better their condition, to elevate and push themselves forward in the world, to gain knowledge, and to improve their minds, and raise themselves in the moral scale as well as in the physical world, which could only be done by sobriety, perseverance, and industry. To that end he would recommend and urge upon them all to learn and acquire a knowledge of the English language, as by it they may attain more readily the end desired—that is, self-elevation and intellectual proficiency, which would make them useful to the community and to their fellow-men, and gain influence in their day and generation; and the higher they rose in that respect the more pleasure and happiness should be in seeing it. True knowledge is a virtue of the most intrinsic value and importance, and those who have the most of it have the greater amount of happiness. He would again say that by learning and studying the English language they would get at the readiest and the best way of obtaining that knowledge and usefulness. It would amply repay them in the end for any little trouble they had in obtaining it. It would make them good and true men, and good men always make good masters, and good masters will be sure to make their men good also. He should always feel proud in seeing all his men prosperous, and earning wages. He would be more happy in having to pay them not only 6d. or 10d., but 12d. or more per month if they could earn it; and he would make it his special care and study to find the best way to improve and better the condition of his men. He intended to make a reserve fund for the benefit of those who may meet with any accident or other calamity while in his employ, so that their wives and families should not have to suffer want or privation through that misfortune, and that that fund shall not be withdrawn during his lifetime, or while he had any connection with the undertaking. (Bapturous cheers.) He felt very proud and happy to see them that night well clad and clean in their persons, which was a good sign, and augured well for their being happy and comfortable. (Cheers.)—Mr. Williams (the agent) here remarked that a four or better conditioned set of men for their number could not be found anywhere; they were all of them young, and possessing good abilities, being healthy, strong and stalwart, agile, and quick in their movements.—Mr. Gibson intimated his intention of making a handsome present to the men who should discover and cut into a body of copper ore in the mine, but he did not expect much results, if any, from the mine for at least the next twelve months, for it required time to open and explore. He was not a tyro in mining, nor ignorant in mining matters as to think or expect that those things could be done in a day or two. It required time, and must have time for its development.—Mr. Gibson sat down amid long and enthusiastic cheering.—Mr. Evans (the jointer) proposed, and was seconded by Mr. E. Jones, of Trefawen, the lord of the soil, Health, and Happiness to Mr. and Mrs. Gibson, and to Mr. Williams, and success to the Panty-Gaseg Mining Company, which was drunk with long and continuous cheering. Other toasts were given and responded to. Speeches were made, and songs in English and Welsh, which pleased Mr. Gibson much. Mr. R. T. Phillips being present, volunteered to interpret to Mr. Gibson and to Mr. Williams what was said by those who were unable to speak in English. The company separated much gratified and pleased with the proceedings of the evening.—Translated from *Cronicle Cymru*.

AN INVITATION TO GEOLOGISTS.—A French correspondent, M. Cases, writing from Bach, in the Department of the Lot, informs us that in the excavation of phosphate of lime, which is used for making glass, bones and teeth are constantly found which evidently belonged to animals extinct before the Flood. In particular M. Cases mentions the task of a mason, 40 centimetres in length, which was broken by the pickaxe of the labourer who excavated it. Our correspondent adds that men of science would find a fertile field for exploration in the district from which he writes.

An article has appeared in the market which has been called Abyssinian gold, and sometimes Talmi gold. Dr. C. Winckler states that this is a brass, consisting of about 91 parts of copper to 8 of zinc, which has an external coating of gold; a very thin sheet of gold being made to adhere to them by rolling them together. This gilded sheet is then formed by the artist into ornamental articles by the use of ingeniously constructed steel tools.

PREVENTING CORROSION OF IRON PIPES.—The invention of Mr. G. H. Smith, of New York, U.S., is based upon the application to the iron tubes, to be protected of a material electrically positive to the iron, and which is, therefore, attacked instead of the iron by the destructive agency that would oxidise and corrode or oxidise the latter. He makes for this purpose an alloy of zinc and iron. For wrought-iron pipes or tubes the protection is best obtained by the use of large cast-iron tubes, such as are used in towns or cities for the conveyance of water, gas, or sewage; he prefers that the said tubes should have annular grooves or channels formed in them for the reception of rings, hoops, or segments made of the protective alloy. When the tubes or pipes to be protected formed part of a steam boiler, he places rings or hoops made of the said alloy upon the said tubes at the ends of the pipes, or at such distances apart thereon as will be found most convenient.

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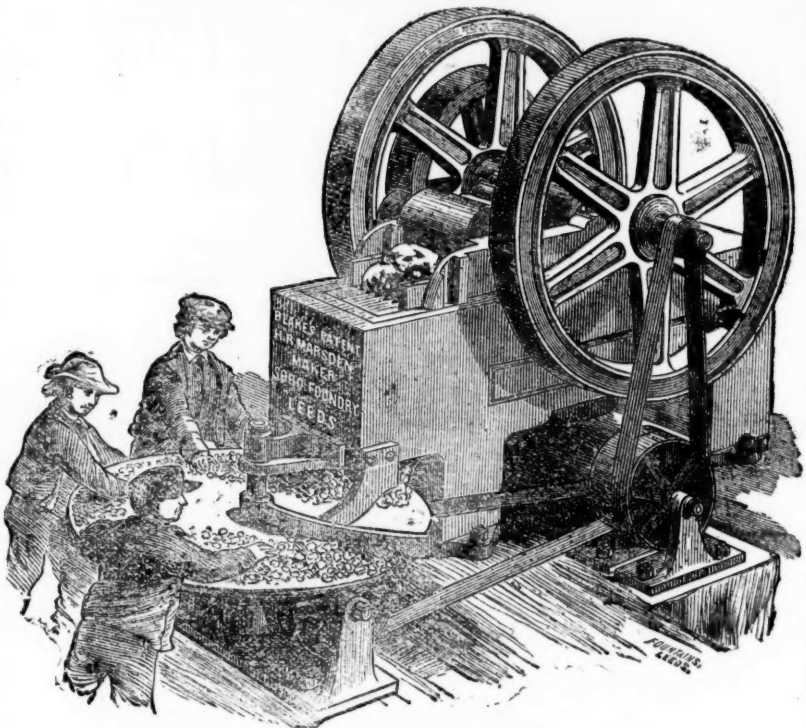
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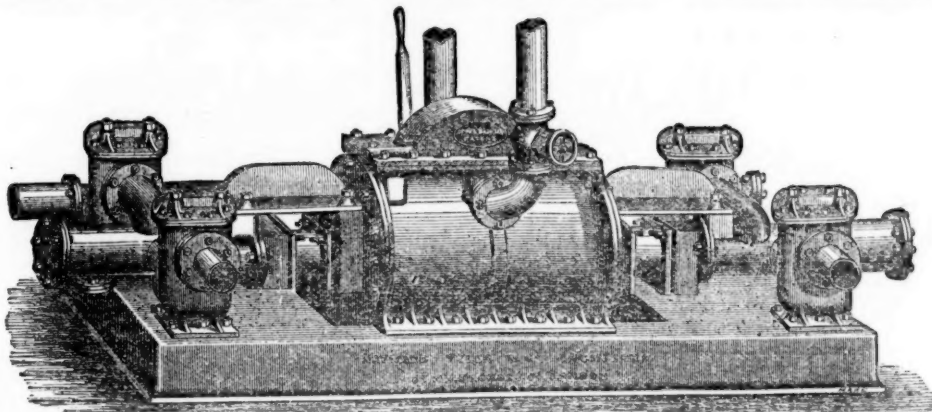
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GENTLEMEN.—In answer to your enquiry, I beg to state that the two "Universal" Pumps supplied to us (through your agent, Mr. T. A. Ashton) are doing our work exceedingly well. We think they are the best in the market, and shall be glad if you will send us another 3 inch cylinder 6 inch pump in one week from this date.

(Signed)

Yours truly, ASTON MAIN COAL COMPANY.

Extract of a Letter from JOHN SIMPSON, Esq., to Hayward Tyler and Co.'s Agent.

Rhos Llantholt Colliery, Caerphilly, near Cardiff, March 4, 1872.

I should like to have the water-piston and clacks the same as in our present pump, as they work exceedingly well, and I do not think it is possible to improve upon the present pump, except by lining the cylinder with brass as ordered.

Full particulars post free on application to—

HAYWARD TYLER AND CO.,
84 AND 85, UPPER WHITECROSS STREET, LONDON, E.C.*The Parys Mines Company, Parys Mines, near Bangor, June 6.*—We have had one of your stone breakers in use during the last 12 months, and Capt. Morecom reports most favourably as to its capabilities of crushing the materials to the required size, and its great economy in doing away with manual labour.For the Parys Mining Company,
H. R. Marsden, Esq. JAMES WILLIAMS.*The Van Mining Company (Limited), Van Mines, Llanidloes, Feb. 6, 1871.*—Our machine, a 10 by 7, is now breaking 180 tons of stone for the crusher every 24 hours. I may say, of all our machinery, that for simplicity of construction and dispatch in their work, they are equal to any thing in the kingdom, but your stone breaker surpasses them all.
H. R. Marsden, Esq., Leeds. W. WILLIAMS.*Chacewater, Cornwall, Jan. 27, 1869.*—I have great pleasure in stating that the patent stone breaker I bought of you some three years ago for mines in Chili, continues to do its work well, and gives great satisfaction. It crushes the hardest copper ore stone—put it through ¼ inch size by horse power—with great ease. I can safely recommend it to all in want of a crusher; can be driven by steam, water, or horse power.
H. R. Marsden, Esq. JAMES PHILLIPS.*Terras Th Mining Co. (Limited), near Gram-pound Road, Cornwall, Jan. 1871.*—Blake's patent stone crusher, supplied by you to this company, is a fascination—the wonder and admiration of the neighbourhood. Its simplicity is also surprising. Persons visiting it when not at work have been heard to remark, "This can't be all of the machine." It will crush to a small size from 8 to 10 tons of very hard and tough elvan rock per hour; taking into its leathern jaws pieces of the hardest rock, weighing 200 lbs. or more, mashing the same into small bits with as much apparent ease and pleasure as does a horse his mouthful of oats. On every 100 tons of the rock crushed by the machine there is a direct saving to the company of not less than £5 over the process of hand labour previously adopted by them, and the indirect saving much more, the machine being ever ready to perform the duties required of it. It breaks the stuff much smaller, and in form so fitted for the stamps, that they will pulverise one-third more in a given time than when performed by hand labour.
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Welsh Gold Mining Company, Dolgelly.—The stone breaker does its work admirably, crushing the hardest stones and quartz. WM. DANIEL.*Oreoca, Ireland.*—My crusher does its work most satisfactorily. It will break 10 tons of the hardest copper ore stone per hour.
WM. G. ROBERTS.*General Fremont's Mines, California.*—The 15 by 7 in. machine effects a saving of the labour of about 20 men, or \$75 per day. The high estimation in which we hold your invention is shown by the fact that Mr. Park has just ordered a third machine for this estate. SILAS WILLIAMS.Your stone breaker gives us great satisfaction. We have broken 101 tons of Spanish pyrites with it in seven hours.
EDWARD AARON.

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BRASS FOUNDERS, COPPERSMITHS, & GAS METER MANUFACTURERS,

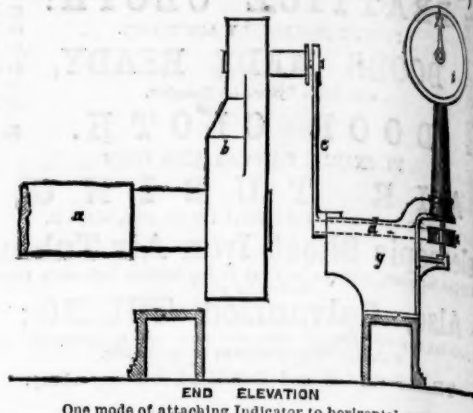


The PEPPER MILL BRASS FOUNDRY COMPANY beg respectfully to invite attention to their IMPROVED SELF-REGISTERING COLLIERY WINDING INDICATOR, which, in addition to its ordinary use of indicating the position of the load in the shaft, registers the number of windings, thus enabling the manager at a glance, and at any moment, to check the return of the banksman or tallyman, by reading off from the dial the number of windings for any stated time.

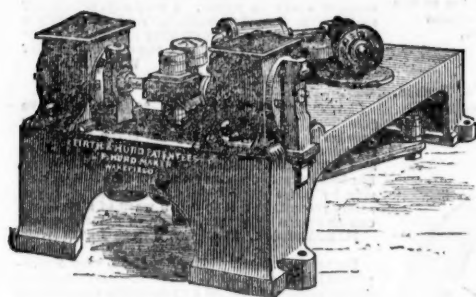
This Indicator is especially adapted for Water Winding or Pumping. Its indications cannot possibly be tampered with, and unerringly show the number of windings or strokes for any stated period, so that it will at once be seen whether or not the person in charge has been fully discharging his duty.

These Winding Indicators are supplied either with or without the Self-registration Dial.

The Pepper Mill Brass Foundry Company will be glad to furnish, on application, sets of drawings illustrative of the simplest and cheapest mode of attaching their indicators to engines of various constructions, either vertical or horizontal.



F. HURD, ENGINEER,



Patent Air-Compressing Engine.

MANUFACTURER
OF PATENT MINING and
EXCAVATING
MACHINERY.

FIRTH'S PATENT
CANNEL
HUB
DRESSER.

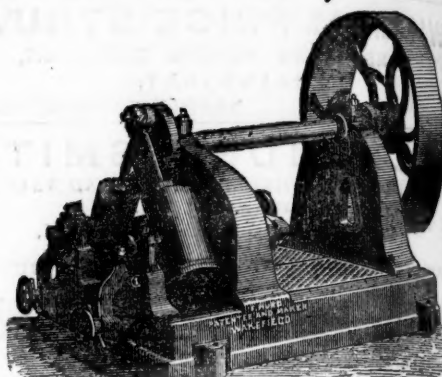
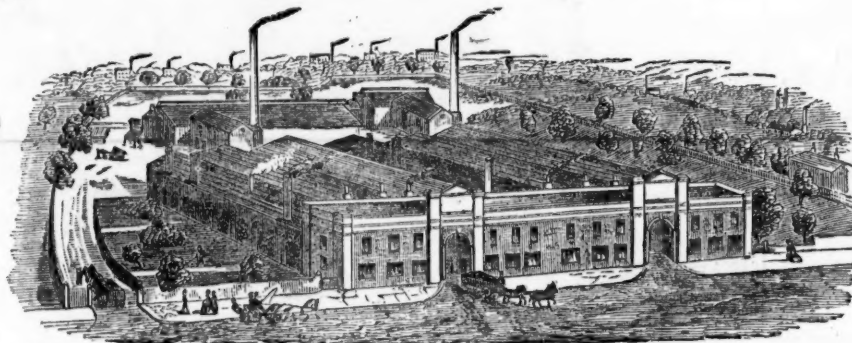


Patent Power, or Hand Straight Work
Coal-Cutting Machine.

MILLWRIGHT, MACHINIST,

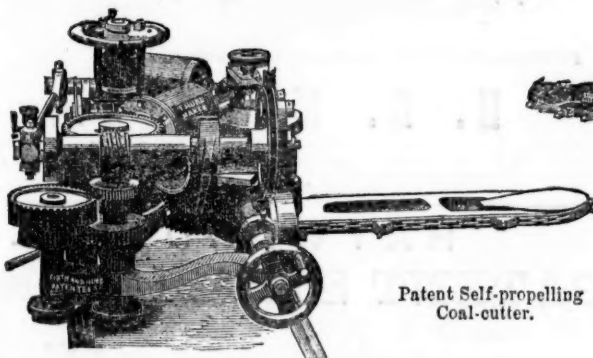
BRASS AND IRON FOUNDER,

ALBION FOUNDRY,
WAKEFIELD.

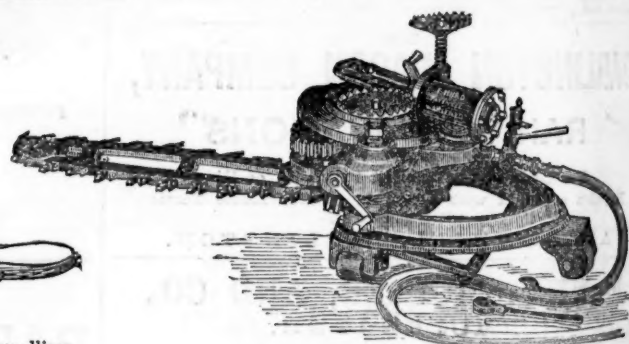


Patent High-speed Reversible Engine, without the
aid of Tappets, Cams, or Eccentrics. Cylinders
either fixed or oscillating.

**HYDRAULIC and AIR-
COMPRESSING
MACHINERY. Heavy, Light,
and Ornamental CASTINGS,
and Patent
WORSTED MACHINERY.**



Patent Self-propelling
Coal-cutter.



Patent Power Pillar-and-Stall Work
Coal-Cutting Machine.

Also, FIRTH'S PATENT ECONOMIC PERMANENT RAILWAY, without the aid of Pins, Bolts, or Wedges, that can be laid by an ordinary labourer with rapidity.

GENERAL CONTRACTOR; and Estimates given for Air-Compressing Machinery and Coal-Cutting Machinery on application.

THE BURLEIGH ROCK DRILL.



THE BEST AND ONLY PRACTICAL
DRILL.

IT DOES NOT GET OUT OF ORDER.

SPECIALLY ADAPTED FOR
SINKING AND MINING PURPOSES.

PROGRESSES through Aberdeen granite at
the incredible rate of 10" per minute.

SAVES £5 a day as compared with hand
labour, independent of the enormous saving ef-
fected in the general expenses, such as PUMP-
ING, VENTILATION, INTEREST OF CAPITAL,
&c., from the fact of the "put out" being in-
creased four-fold.

DRILL POINTS.—The saving in steel alone
is considerable. One drill will go through
20 feet of Aberdeen granite without sharp-
ening.

Orders received and executed solely by—

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21, NEW BRIDGE STREET, E.C., LONDON,
ENGINEERS, CONTRACTORS, AND GENERAL MERCHANTS.

PRIZE MEDALS—PARIS, 1867; HAVRE, 1868; HIGHLAND SOCIETY, 1870.

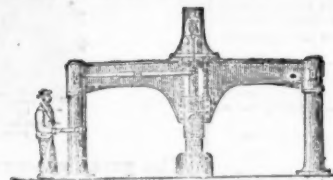
B. & S. MASSEY, OPENSHAW CANAL IRONWORKS, MANCHESTER.



Special
Steam Stamp.



Hammer for General
Smith Work, &c.



Hammer for Wheel-making,
Copper Work, &c.



Hammer for General
Smith Work, &c.



Hammer for Heavy
Forgings.

PATENTEES AND MAKERS OF DOUBLE AND SINGLE-ACTING STEAM HAMMERS of all sizes, from 17 lbs. to
20 tons, with Self-acting or Hand Motions, in either case giving a perfectly DEAD-BLOW, while the former may be worked by hand when desired.
Large Hammers, with Improved Framing, in Cast or Wrought Iron. Small Hammers working up to 200 blows per minute, in some cases being
worked by the foot of the smith, and not requiring any separate driver.

SPECIAL STEAM STAMPS, of great importance for Smith Work, Bolt-making, Punching, Bending, &c.
Hammers for Engineers, Machinists, Shipbuilders, Steel Tilters, Millwrights, Coppersmiths, Railway Carriage and Wagon Builders, Colliery Proprietors,
Ship Smiths, Bolt Makers, Cutters, File Makers, Spindle and Flyer Makers, Spade Makers, Locomotive and other Wheel Makers, &c.; also for use in Repair-
ing Smithies of Mills and Works of all kinds, for Straightening Bars, Bending Cranks, Breaking Pig-iron, &c.

STEAM HAMMERS AND STEAM STAMPS MAY ALWAYS BE SEEN AT WORK.